Development, Oviposition and Longevity of *Aleurothrixus floccosus* (Maskell) (Homoptera: Aleyrodidae)[1]

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ABSTRACT

Development of the woolly whitefly, *Aleurothrixus floccosus* (Maskell) was observed on seedling lemon plants maintained at ambient temperature (ave. 22.5°C) and relative humidity. Total developmental time from egg-to-adult averaged 27.4 ± 2.2 d. Peak adult emergence occurred between 0600 and 0900. Developmental rates and peak time of adult emergence were similar to those of other whiteflies recorded in literature. Oviposition began within 1 day after emergence and averaged 53.2 ± 9.3 eggs/female. Average adult longevity was 36.4 ± 13.6 d.

The woolly whitefly (WWF), *Aleurothrixus floccosus* (Maskell) was first described from specimens collected in Jamaica (Maskell 1895); it has since spread to the continental U.S.A. (Back 1910, Meyerdirk et al. 1967), Africa (Cohic 1968), southern Europe (Greathead 1976) and, most recently, Hawaii (Nakahara 1983).

The WWF has a wide host range; in Hawaii it can complete development on over 50 species of plants in 39 genera and 31 families. While heaviest infestations are found on *Citrus* spp., especially orange and grapefruit trees (Clausen 1978), significant numbers of WWF may also occur on guava *(Psidium guajava)* and seagrape *(Coccoloba uvifera)* (Back 1910 and Clausen 1978). Other hosts rarely have more than trace infestations. This reported preference is of greatest concern to Hawaiian agriculture. Citrus and guava are important commercial crops with sales averaging over $500,000 annually.

Severity of infestation in Hawaii, and elsewhere, has been variable. Most infestations are light and difficult to detect, but there have been instances of severe infestation, especially with incipient populations. Fortunately, in Hawaii the WWF has not developed into a serious pest, ostensibly due to the action of several biological control agents. Because of its potential importance to Hawaiian agriculture, it is important to understand the basic biology of the WWF. The following paper reports on the duration of the life stages, number of eggs laid, longevity and ovipositional behavior of the WWF.

MATERIALS AND METHODS

During October 1982, approximately 100 field-collected adult WWF were released on each of two lemon seedlings inside identical nylon-screened cages (30 × 30 × 60 cm). Cages were maintained outdoors in a common area. Seasonal temperatures and relative humidities ranged from 17 to 28.5°C and 40 to 83%, respectively. Foliage was examined daily, in situ, with a dissecting microscope. Oviposition date and location of each egg were recorded on a templet, or map, of the leaf. Adults were removed from the cages after 3 days, 306 eggs were laid during that period. These eggs and subsequent immatures were observed daily to determine: time of eclosion, distance of 1st instar (crawler) movement and day of ecdysis to second, third and

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fourth instar nymphs. Fourth instars were examined daily at ca. 0600, 0900, 1200 and 1500 h to establish the time of adult emergence.

Adult fecundity and longevity were determined by collecting newly emerged adults and placing them on terminal foliage of a lemon tree branch inside an organdy sleeve cage (35 cm by 12 cm diam.). Each sleeve had two wooden X-shaped internal supports to prevent contact between organdy and leaves. Daily adult collections were held in separate cages. When more than 15 adults emerged on a single day, whiteflies were divided into 2 cages. Total numbers of eggs laid and adult mortality were recorded daily for each sleeve cage. Oviposition behavior was also noted.

RESULTS AND DISCUSSION

Egg-to-adult developmental time at 22.5 ± 2.8°C was 27.4 ± 2.2d. This is comparable to a developmental time of 27.8 ± 1.3d at 22.5°C (Butler et al. 1983) for *Bemisia tabaci* Gennadius and 28d at 22°C (Vet et al. 1980) for *Trialeurodes vaporariorum* (Westwood). The developmental times for individual stages of WWF are summarized in Table 1.

Crawler movement and positioning on the leaf was accomplished in less than 20 minutes. Mean distance of movement was 31 ± 10.4 mm (range 1 to 65 mm). Crawlers did not move from the leaf on which they hatched, and were not observed on upper leaf surfaces.

A total of 74 adults emerged, all females (Table 2). Peak emergence (71.6%) occurred between 0600 and 0900 h. Fewest adults emerged between 1500 and 0600 h. Butler et al. (1983) and Morrill and Back (1910) reported similar findings for *B. tabaci* and *Dialeurodes citiri* (Ashmead) (as *Aleyrodes citri*), respectively.

Ovipositoin began within 1 day after emergence. The average number of eggs laid per female was 53.2 ± 9.3 (n=74). Most eggs were deposited between 1500 and 0600 h. Oviposition behavior varied. Approximately 90% of the eggs were deposited in concentric rings (eggs laid in an arc of >180 degrees), formed by females pivoting on their mouthparts, which were inserted into leaf tissues, during oviposition. Females often remained stationary for up to 4 days while ovipositing in this manner. The average number of eggs in a ring was 38.3 ± 20.7 (n=38), with a range of 15–72. The remainder of the eggs were deposited singly or in small groups. The latter were often deposited in arcs (<180 degrees). Eggs were invariably deposited on lower leaf surfaces. Female mouthparts were always inserted into the leaf during oviposition.

TABLE 1. Duration of *Aleurothrixus floccosus* life stages at ambient temperature (range 17–28.5°C, mean 22.5°C) and relative humidity (40–83%).

Stage	n	Mean Duration (Days) X ± SE	Range
Egg	306	9.9 ± 1.3	8–13
1st instar	292	4.9 ± 1.6	2–10
2nd instar	128	7.8 ± 2.4	3–12
3rd instar	110	8.1 ± 1.3	5–10
4th instar	84	6.6 ± 1.2	5–10
Total (egg-to-adult)	74	27.4 ± 2.2	22–31
Adult	74	36.4 ± 13.6	1–51

TABLE 2. Emergence of adult *Aleurothrixus floccosus* during different time periods.

Emergence Period	Number Emerged	Total Emergence (%)
0600 to 0900	53	71.6
0900 to 1200	13	17.6
1200 to 1500	5	6.8
1500 to 0600	3	4.0
Total	74	100.00

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